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## The Grey Squirrel *Sciurus carolinensis* in Adelaide, South Australia: its introduction and eradication

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### Abstract

In addition to its known former presence in Melbourne and Ballarat, in Victoria, the presence of the Grey Squirrel *Sciurus carolinensis* in Adelaide, South Australia from 1917 to about 1922 is detailed. Founder animals were likely sourced from the Melbourne population, with the Adelaide Grey Squirrel population subsequently arising from escapes from the zoological gardens, or animals privately sourced from Toorak, Victoria. Relatively prompt action by Government to control the Squirrels saw a bounty offered and the apparent main population controlled by Adelaide City Council staff. The Squirrels, restricted to urban plantings of northern hemisphere trees, were subsequently eradicated and were last recorded in 1922. It is unknown what contribution either control method contributed to the eventual eradication of this introduced species. The successful eradication of the Grey Squirrel from Adelaide provides an additional international vertebrate pest eradication record to further our understanding of achieving success in this difficult but valuable pest management goal. (*The Victorian Naturalist* **126** (4) 2009, 150-155)

**Keywords:** Grey Squirrel, trapping, urban, bounty, pest control

### Introduction

The Grey Squirrel *Sciurus carolinensis* Gmelin is a native of the eastern half of North America (Koprowski 1994). Seeds, fruits and flowers of northern hemisphere plants dominate its diet, but it is also recorded consuming fungi, insects and bird eggs and nestlings (Seebeck 1989; Koprowski 1994). Though a species that cannot hibernate (Seebeck 1989), the Grey Squirrel still requires den sites, the formation of which can take up to 30 years in their preferred northern hemisphere plants (Koprowski 1994). Densities can reach >21/ha in urban areas (Koprowski 1994).

In his comprehensive compilation of mammal introduction accounts, Long (2003) detailed the early twentieth century introduction of the Grey Squirrel to Melbourne (Barrett 1934; Watts and Aslin 1981; Seebeck 1984) and subsequently to Ballarat, Victoria (Watts and Aslin 1981). That this species was also introduced into, and subsequently eradicated from, Adelaide, South Australia, also in the early twentieth century, appears to have escaped notice (Clayton *et al.* 2006, plus amendments).

First reference to the Grey Squirrel in Adelaide appears to be an August 1919 media article highlighting their depredations of walnuts, acorns and pine seeds in the Botanic Garden (depredation also reported in Brooker and Bailey 1919) and presenting their potential to 'become a serious scourge unless action is immediately taken to combat it effectively' (Anon 1919a p. 9). Reference to then current primary producer losses from the introduced Red Fox *Vulpes vulpes* and European Rabbit *Oryctolagus cuniculus* may have aided general awareness and sensitivity towards the potential threat of another introduced pest, and stimulated rapid management of the problem. However, the response to this introduced pest, described by Seebeck (1984 p. 66) as 'probably the most attractive – and certainly one of the most inoffensive [introduced animals]', seems somewhat incongruous, although ultimately seemingly effective, arising apparently from one newspaper article. Whether or not there was any associated public and industry pressure for management of this animal is unknown, but it appears to have been limited, with no evidence in associated media articles.

A meeting to discuss the Grey Squirrel issue was requested by State Government and held with the Directors of the Botanic and Zoological Gardens, probably in late October 1919. The outcome of this meeting is detailed in a report highlighted in November 1919 in the second and apparently last major media article on the issue (Anon 1919b p. 5). Mention in the report of the squirrels affording 'a further illustration of the absolute necessity for the department having power to prohibit any person from bringing into the State, without permission, any bird or animal' suggests the Government's response to the squirrels may have arisen in part from a desire for additional import control powers.

## Methods

In seeking to substantiate and document the former distribution, abundance and eradication of the Grey Squirrel in Adelaide, newspapers of the period via The Manning Index of South Australian History (<http://www.slsa.sa.gov.au/manning/search.html>), state records, Adelaide City archival files and archival material in the Burnside Council library were searched.

The report published in the media (Anon 1919b), an Adelaide City file of correspond-

ence on the issue (TCDKT1919/3418), a review of 'South Australia. Botanic Garden – Report for the year 1917-18' to the year ended 30 June 1922, and a review of 'South Australia. Report of the Board of Governors of the Botanic Garden of Adelaide' for the years 1922-23 to 1924-25, provided primary information on the distribution, relative abundance and management of the Grey Squirrel in Adelaide. No documentation could be located in likely State Record files or the Burnside Council library (archives).

## Origin of Grey Squirrels

Although a letter published in response to these media articles suggests some squirrels may have been present in Adelaide ~30 years earlier [~1890] (Horsnell 1919), soon after their reported introduction to Melbourne (Barrett 1934; Seebeck 1984) and interestingly less than five kilometres from their reported 1917 release site, it appears they either did not persist, or perhaps were misidentified possums – a suggestion I received for some of my enquiries!

There appear to be two hypotheses for the origin of the Grey Squirrels that established in Adelaide in 1917. The first was suggested by the media, being that the squirrels arose from Zoological Garden escapees (Anon 1919a). The second was proposed in the report to Government, being that they appear to have arisen from 'a resident from the eastern suburbs' introducing some squirrels 'two years ago [1917]' from the introduced population at Toorak, Victoria (Anon 1919b p. 5). Both hypotheses appear to have support, with both pathways enabling other successful international introductions (Bertolino 2009). The likelihood that this species would establish from as few as a single pair was 0.57 per cent (Bertolino 2009).

The Botanic Garden and Park, which lie adjacent to the zoo, have received most mention and appear to have been the centre of the squirrel population. This is consistent with the hypothesis of zoo escape and parallels the situation in Victoria, with both populations centred on their release sites. However, the South Australian Museum has three specimens of *S. carolinensis*, with two of them (M01486 and M01487) being mounted skins from squirrels sourced in 1922 from the Adelaide Zoo. [The other (M18615) is a skull sourced from S. McEwen in 1996 from an unknown location]. Adelaide Zoo has no record of their previous Grey Squirrel collection and hence the two squirrels provided to the

museum might have been their entire captive colony, or perhaps were wild Squirrels sourced from their precinct (L. Andrews Adelaide Zoo 2008 pers. comm. 12 August). If they were the zoo's collection of Grey Squirrels, their demise in 1922 and provision to the museum may have been coincidental with the demise of the wild population, or a conscious decision to remove this source of potential escapees and zoo criticism (as per Anon 1919a).

Support for an eastern suburbs resident releasing the squirrels is found in the detail provided for this hypothesis, including source of the animals, their origin, cage design and escape (Anon 1919b). Criticisms could be that one of its supporters, presenting it to contradict the zoo escape hypothesis, was the then zoo director, and that little documentation could be found for the existence and eradication of squirrels in this area cf. the numerous reports for the Botanic Garden and Park, and those for Victoria, which relate to their original release sites.

### Distribution and abundance

It appears that the squirrels were limited in distribution to an area of approximately 40 km<sup>2</sup> north and east of the city centre. Reported locations (Fig. 1) and abundance include:

- 'the pest has multiplied rapidly ... and appears to be distributed over a considerable portion of the metropolitan area. There are hundreds and possibly thousands of them in the Botanic Park and garden, and they have also been observed as far afield as Glen Osmond and Montefiore Hill' (Anon 1919a p. 9).
- 'more or less numerous in the timbered areas from Burnside to Walkerville, but we have no exact knowledge of the extent of their spread.' Not unusual in an evening to see 'half a dozen at different places' in the Botanic Garden (Anon 1919b p. 5).
- 'more or less numerous in the various plantations through the Parks, along the River [Torrens] and out toward Burnside' (letter from the secretary of the Office of the Minister of Industry dated 5 November 1919, in TCDKT1919/3418).
- 'in the Plantations along the War-Memorial-Drive & in Montefiore-Hill-Plantations; they are not numerous' (letter from 'City Gardener' dated 8 November 1919, in TCDKT1919/3418).

### Control

An outcome of the meeting to discuss the squirrel issue was 'that immediate action is necessary on the part of the Government ... and that the only effective way would be to offer a bonus for all skins' (Anon 1919b p. 5). This approach was put to the Adelaide City Council with a request that they 'share half the cost in so far as any Squirrels taken within the City Boundaries are concerned' (letters from the Secretary of the Office of the Minister of Industry dated 5 November and 8 December 1919, in TCDKT1919/3418). Council declined the request for financial assistance but agreed to undertake 'other measures' to destroy the squirrels in their Council area, eventually instructing their foreman to use a shotgun to shoot squirrels 'in the parklands in the vicinity of the Nursery ... only shot when in the trees' (letters from the Town Clerk to the Office of the Minister of Industry dated 22 December 1919 and to the City Gardener dated 13 January 1920, in TCDKT1919/3418).

No records of the 2/6d. (2 shillings and sixpence; = AU\$7.11 @ 2008 – [www.rba.gov.au/calculator/calc.go](http://www.rba.gov.au/calculator/calc.go)) bounty payments by Government could be located, but it is likely that they were paid out for squirrel skins over their whole distribution, from January 1920 (Fig. 2) to perhaps 1922, the year they were last reported in the Botanic Garden (Brooker and Bailey 1922, 1923). The only record of squirrels being trapped for the bounty is the account described in Pitt (1967 p. 7) and this was from the Adelaide City Council area. In this account the then Museum taxidermist had two squirrels released that he had trapped outside 'the Archives' for the bounty. The lady who released the squirrels commenced her position in 1921, so this account may have come from this year or perhaps 1922 (Brooker and Bailey 1922, 1923).

### Discussion

The story of the Grey Squirrel in Australia now involves three introductions, Melbourne, Ballarat and Adelaide. All of these populations have now disappeared. In our desire to understand success and failure in vertebrate introductions (Bertolino 2009; Simberloff 2009), it appears the critical issues of suitable habitat, predation, competition and control effort have all influenced the failure of these introductions.



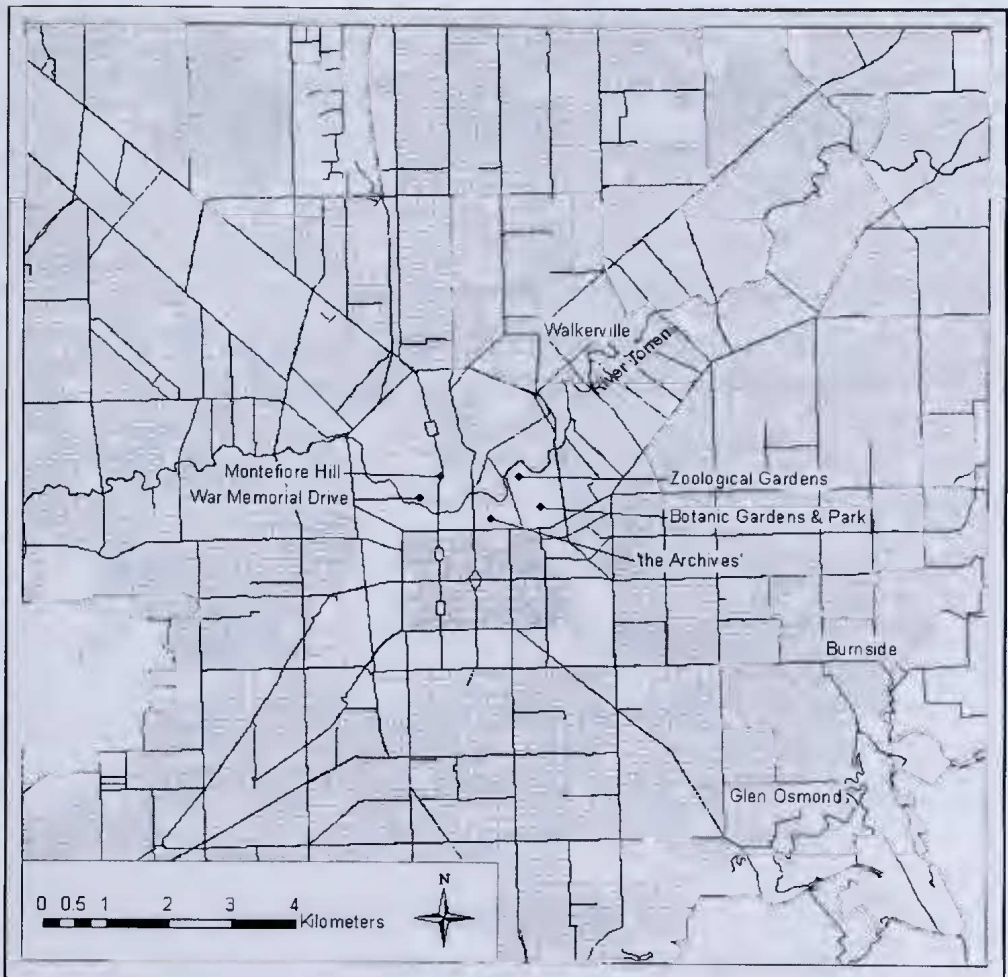


Fig. 1. Distribution of the Grey Squirrel in Adelaide, South Australia relative to the city centre (in the middle), showing place names as used in the text.

All introductions were spatially restricted (~4-60 km<sup>2</sup>; Seebeck 1984) and limited to botanical gardens and urban areas where plantings of northern hemisphere trees such as oaks and pines, and the supplemental feeding by people, could support these exotic animals. However it appears that this limited seasonal and sporadic food supply, coupled with competition from Brush-tailed Possums *Trichosurus vulpecula* and some Cat *Felis catus* predation, were critical factors in the demise of the two Victorian Grey Squirrel populations (Seebeck 1984). Their survival for perhaps 60 and 36 years in Melbourne and Ballarat respectively, compared with only

about five years in Adelaide, appears primarily related to active control being undertaken only on the Adelaide population.

An interesting comparison is found in the Five-lined Palm Squirrel *Funambulus pennanti* introduced to the South Perth Zoological Gardens in 1898 (Sedgwick 1968) and to Sydney's Taronga Park Zoo, likely at about the same time (Watts and Aslin 1981). Like the South Australian and two Victorian (Seebeck 1984) Grey Squirrel populations, both Palm Squirrel populations remained strongly associated with their release sites. For the Sydney population this was until their demise in about 1977,

# AMERICAN GRAY SQUIRREL.

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Owing to the damage done by these animals to various garden crops in the vicinity of Adelaide the Government offers

**A BONUS OF 2/6 PER SKIN**

on all Squirrel Skins delivered to the  
**CHIEF INSPECTOR OF FISHERIES AND GAME,  
FLINDERS STREET, ADELAIDE.**

**Skins must be dried and in all cases  
tail skin must be attached.**

**H. NEWMAN BARWELL,**

**22nd January, 1920.**

**MINISTER OF INDUSTRY.**

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R. E. E. ROGERS, Government Printer, North Terrace, Adelaide.

**Fig. 2:** 1920 bounty poster for the Grey Squirrel in Adelaide, South Australia (originals on file in TCD-KT1919/3418).

speculated due to loss of habitat trees and rat bait poisoning (Watts and Aslin 1981). This demise with non-targeted control measures somewhat parallels the active control measures causing loss of the South Australian Grey Squirrel population. In comparison, the Perth Palm Squirrel population remains extant and an active management issue. Though still concentrated at its zoo release site, human movement of the animals has resulted in new city and regional outbreaks being identified (JL

Long and WA Department of Agriculture and Food; unpubl. data).

The decision to commence control of Grey Squirrels within two years of their release (Anon 1919b) obviously limited the distribution and abundance of Grey Squirrels in Adelaide, minimised control costs and maximised the likelihood of eradication (Simberloff 2009). Because no records of bounty payments were located, it cannot be established what contribution this strategy had on the control of this pest. How-

ever, the decision of the Adelaide City Council to undertake shooting of the squirrels in their area, seemingly the species' population centre, was probably a critical factor. An alternative decision to tolerate the squirrels' impacts on garden, orchard and plantation plants, due to a belief that they were of greater aesthetic value, coupled with urban support and supplemental feeding, could have enabled persistence of this vertebrate pest in the Adelaide urban environment.

### Acknowledgements

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## One Hundred and One Years Ago

FROGS. — Among my exhibits at the recent conversazione were two frogs (Crinia?) which lay their eggs away from water; also a number of tadpoles hatched from eggs laid away from water. Some of the eggs were merely kept moist, and the tadpoles emerged in about forty-eight hours, but from a number of the eggs which were dropped into an aquarium on 1st June last the tadpoles did not emerge till 29th July and later. Why should there be so great a difference between the hatching in air and in water?—H. W. WILSON.

From *The Victorian Naturalist* XXV, p. 120, November 5, 1908

